

Soils inventory unearths new species at Great Smoky Mountains National Park

by Mike Jenkins and Pete Biggam



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Distinct vegetation communities of the southern Appalachian Mountains, heath balds are dominated by extremely high densities of evergreen shrubs. The shrubs produce a thick layer of highly acidic leaf litter, resulting in acidic surface soils that resist invasion by tree seedlings. The ongoing soils survey documented 21 new “species” of soils in Great Smoky Mountains National Park and spawned further studies of the heath bald soils.

STUDYING SOIL MAY SEEM AS DULL AS DIRT, BUT soil scientists are finding exciting new worlds in the earth underlying Great Smoky Mountains National Park. The Soil Resources Inventory is giving park staff and researchers valuable information on the role of soils in ecosystems. To date, approximately 65% of Great Smoky Mountains National Park has been mapped, and soil scientists have encountered 21 new “species” of soils not previously recognized. Most of them exist at elevations above 4,600 feet where climate and geologic materials interact in unique ways to form new soils. The National Park Service Inventory and Monitoring Program is working cooperatively with soil scientists from the USDA–Natural Resources Conservation Service to obtain detailed information regarding the physical, chemical, and biological properties of soils in the park. Once completed, the inventory will provide Great Smoky Mountains National Park with a powerful tool for ongoing management and research efforts.

One of the greatest limitations to the management of natural resources across a large area is poor understanding of species distributions and their relationship to the underlying physical environment. Physical and chemical properties of soils are known to be critical to the distribution of forest types and vascular plants, but these properties are also important on a smaller scale in determining the distribution of the vast number of species that comprise the flora and fauna of the park’s soils. An All Taxa Biodiversity Inventory (ATBI) is being conducted to identify and determine distributions of all species of life in the park. Soil and leaf litter samples have revealed many species not only previously unknown in the park, but new to science as well. To date, 37 new species of springtails (primitive insects), 14 species of slime molds, 4 species of earthworms, and 3 species of land snails have been identified. Information from the soils inventory will allow scientists to understand the habitat needs of species identified by the ATBI and to predict their distribution and abundance throughout the park.

Although still in progress, the soils inventory has already revealed new areas for scientific study. For example, the unusual properties of the organic soils formed under heath balds have spawned a cooperative study with Western Carolina University to determine the age and paleoecology of these unique areas. Soil samples collected at various depths throughout the soil profile will be analyzed

to determine the age of soil deposits and their rate of accumulation. This information may help solve the long-standing puzzle of how and when these distinctive vegetation communities were formed.

In addition to the soils inventory, efforts are being made to map the geology and vegetation communities of the park. These three layers of information will allow scientists to examine biological and physical relationships across the park at a level of detail never before possible, so that park managers may be better able to predict potential impacts of environmental threats. For example, the park receives some of the highest deposition rates of acidic sulfur and nitrogen in North America. Efforts are under way to model deposition levels across the park. Once this model is completed, resource managers will be able to understand which soil types are most vulnerable to acidification and which vegetation types and biological communities may be impacted. ■

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Primitive insects of the order Collembola, springtails exist in the tens of thousands per square meter of Great Smokies forest soil and leaf litter. The dark-colored specimen (*Pseudachorutes simplex*) is a common soil-dweller in the park; the pale specimen (genus *Neanura*) may be new to science.